REMARKS

In response to the Office Action mailed on 2nd May, 2005, Applicant wishes to enter the following remarks for the Examiner's consideration. Applicant has amended claims 1, 8 and 28. Claims 1-37 are pending in the application.

Objections to the Claims

Claim 8 has been amended to replace "in" with "is".

Rejection of claims under 35 USC §112

Claim 28 has been amended to provide antecedent basis for the phrase "ultrasonic pulse".

Rejection of claims under 35 USC §102(b)

Claims 1, 3-4, 14, 15, 29, 34, 36 and 37 have been rejected under 35 USC §102(b) as being anticipated by Nagasaki (Patent No. US 5,014,711).

Claims 1-6, 10-20, 24-27 and 29-37 have been rejected under 35 USC §102(b) as being anticipated by Iinuma (Patent No. US 4,252,125).

Claims 1-5, 10, 14-18, 24-27 and 29-37 have been rejected under 35 USC §102(b) as being anticipated by Ries et al. (Patent No. US 4,058,000).

Claims 1-6, 10-20, 24-27 and 29-37 have been rejected under 35 USC §102(b) as being anticipated by Ries et al. (Patent No. US 4,164,150). Applicant respectfully traverses these rejections of the claims.

Claim 1 has been amended, as discussed in a telephone interview with the examiner on 06/13/05, to call for the ultrasonic transducer to be operable to emit ultrasound having a center frequency greater than 100 MHz and for the first temperature to be a temperature at which attenuation in the coupling medium is reduced compared to attenuation in the coupling medium at ambient temperature. None of the cited references suggest emitting ultrasound having a center frequency greater than 100 MHz or altering the temperature of the coupling medium to reduce attenuation of the ultrasound. Nagasaki teaches maintaining the coupling medium at a constant temperature

so as to maintain a constant sound speed in the coupling medium. Iinuma teaches maintaining the coupling medium at a constant temperature so as to maintain constant acoustic impedance in the coupling medium. It is well known to those of ordinary skill in the art that medical ultrasound of a human body is at frequencies well below 100MHz. This is emphasized in the Nagasaki reference by the use of an acoustic lens having a large diameter (column 3, line 25). Further, Nagasaki makes no reference to attenuation of the ultrasound. At low frequencies, attenuation of the ultrasound with distance is much smaller than at high frequencies (see the specification page 15, line 20, to page16, line 7). In addition, at low frequencies the change in attenuation coefficient with temperature is much smaller. Nagaski does not disclose, teach or otherwise suggest adjusting the temperature of the coupling fluid to reduce attenuation at high frequencies.

Further, there is no motivation provided to one of ordinary skill in the art to modify the Nagasaki reference to adjust the temperature of the coupling fluid to reduce attenuation. Neither is there motivation to operate at 100MHz or above, since at 100MHz, the ultrasound will not penetrate far enough into a body to produce an image – it will be attenuated in the skin. In addition, since varying the temperature of the coupling fluid at lower frequencies has negligible affect on attenuation, there is no reasonable expectation that varying the temperature will have an appreciable effect at higher frequencies. Therefore, claim 1 is not obvious in view of Nagaski or Iiuma.

Reis (US 4,164,150 and US 4,058,000) teaches varying the temperature of the coupling medium to vary the refraction angle of an ultrasonic pulse at the interface between a pipe and the coupling fluid. This change in angle is due to a change in the sound speed of the coupling medium (US 4,058,000 column 4, line 12-22). Reis teaches that the optimal temperature of the coupling fluid is determined by the geometry of the pipe (US 4, 164,150 column 3, lines 61-68). This teaches away from the current claims, which calls for the temperature to be adjusted to reduce attenuation in the coupling fluid.

Further, there is no motivation provided to one of ordinary skill in the art to modify the Reis references to adjust the temperature of the coupling fluid to

reduce attenuation. Neither is there motivation to operate at 100MHz, since welded pipes are typically too large to be imaged by such high frequency ultrasound.

Claims 2-6, 10-13 depend from claim 1.

The examiner has asserted that rejected claims 14-20, 24-27 and 29-37 are commensurate with claims 1-6 and 10-13 and has rejected the claims on the same grounds. In accordance with MPEP 2131:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The applicant submits that claims 14-20, 24-27 and 29-37 contain elements that are not recited in claims 1-6 and 10-13 and that the rejection is thus improper. The individual claims are discussed below.

In a telephone interview with the examiner conducted on 06/13/05, the examiner agreed that if elements of claims 14-20, 24-27 and 29-37 were not recited in 1-6 and 10-13, then a second, non-final, office action would be issued to address those elements.

Claim 14 calls for the temperature of a coupling medium between the ultrasonic transducer and the object under inspection to be at a first predetermined temperature for which the attenuation of the ultrasonic energy in the coupling medium at the first predetermined temperature is reduced compared to the attenuation of the ultrasonic energy in the coupling medium at an ambient temperature. The element of selecting the first temperature to reduce attenuation in the coupling fluid is not referenced in any of claims 1-6 or 10-13 as originally filed. Thus, claim 14 is not commensurate with claims 1-6 or 10-13.

The cited references disclose controlling temperature to maintain or adjust sound speed. There is no teaching that attenuation is altered or that the temperature is controlled to reduce attenuation. The cited references use

ultrasound at lower frequencies where attenuation is less significant and where temperature has a negligible effect on attenuation.

Claim 19 calls for circulating the water in the reservoir to maintain an even temperature distribution. This element is not included in any of claims 1-6 and 10-13. This element is not disclosed in the cited references.

Claim 25 includes the element of the ultrasonic transducer sensing ultrasound emitted by the object. The cited references deal with sensing ultrasound that emitted by a transducer and then reflected or refracted by the object. However, some objects emit ultrasound due to other excitations, such as stress or heating, for example.

Claims 29-33 provide a method for selecting a preferred temperature of a coupling medium in an ultrasonic inspection system. These claims are not commensurate with any of the claims 1-6 or 10-13, nor is the method disclosed in the cited references.

Claims 34-37 provide a method for ultrasonic inspection of an object having a predetermined operating temperature. The temperature of the object is controlled to be substantially equal to the predetermined operating temperature. In the cited references, the temperature of the coupling fluid is controlled, rather than the temperature of the object. In the Iinuma and Nagasaki references, the object under inspection is a human body. The human body is maintained at a constant temperature without the need for external temperature control. The Ries reference is concerned with defects in pipes. There is no teaching in the Ries reference that a pipe can have a predetermined operating temperature, or of the desirability of maintaining that temperature during ultrasonic scanning.

In light of the foregoing amendment and remarks, Applicant respectfully submits that the cited reference does not teach, suggest, disclose or otherwise anticipate the recitations of claims 1-6, 10-20, 24-27 and 29-37.

Applicant thus respectfully requests that this basis of rejection of the claims be withdrawn and that a Notice of Allowance for these claims be mailed at the Examiner's earliest convenience.

Rejection of claims under 35 USC §103(a)

Claims 7-9, 21-23 and 28 have been rejected under 35 USC §103(a) as being obvious over Nagasaki (Patent No. US 5,014,711) or Iinuma (Patent No. US 4,252,125) or Ries et al. (Patent No. US 4,164,150). Applicant respectfully traverses this rejection of the claims.

The Examiner acknowledges that the cited references fail to teach, disclose or suggest the recitation of claims 7-9, 21-23 and 28.

Regarding claim 7, the examiner opines that it would be obvious to a person of ordinary skill in the art to employ a second temperature controller to control the temperature of the object under inspection to have a temperature the same as that of the coupling fluid. However, in the Iinuma and Nagasaki references, the object under inspection is a human body. The human body is maintained at a constant temperature without the need for a second temperature controller, so there is no motivation to include a second heater. Further, if an object is in a liquid at a constant temperature, it will achieve the same constant temperature as the liquid, so there is no motivation to add a second temperature controller.

In claim 7, the object is held at a second temperature, rather than the first temperature. The second temperature may be different to first temperature. For example, the operating temperature of an electronic part may be higher than the selected temperature of the coupling liquid. Some defects in the part may only be apparent at the operating temperature, so there is a benefit to maintaining the part at a temperature close to its operating temperature. It is unlikely that the operating temperature will match the temperature at which attenuation of the ultrasound is minimized. The use of a second temperature controller allows the object and the coupling fluid to be maintained at different temperatures.

Claim 8 depends from claim 7.

Claim 9 calls for a second temperature sensor to be operable to sense the temperature of the object under inspection. The examiner states that it would be obvious to one of ordinary skill in the art to use the second temperature sensor to ensure that the temperature of the object matched that of the coupling fluid. However, as discussed above with reference to claim 7, the use of a second temperature sensor allows the object and the coupling fluid to be maintained at different temperatures.

Claims 21-23 call for sensing the temperature of the object under inspection and operating the ultrasonic transducer when the temperature of the object under inspection is substantially equal to a second predetermined temperature. As discussed above with reference to claim 7, the second predetermined temperature may be different to the first temperature. This is emphasized in claim 23 in which the object is a microelectronic device and wherein the second predetermined temperature is representative of an operating temperature of the microelectronic device.

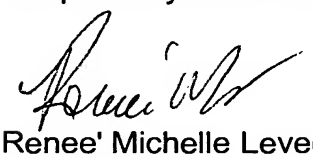
Claim 28 calls for the ultrasonic transducer to be operated to generate an ultrasonic pulse having a center-frequency greater than 100 MHz. While the desirability of increasing the frequency may be apparent, it is difficult in practice for an ultrasonic scanner to operate at such high frequencies. One reason for this is the high attenuation in the coupling fluid at high frequencies. This causes the ultrasonic pulse (and its reflection) to be attenuated over very short distances. In claim 28, which depends from claim 14, this problem is mitigated by controlling the temperature of a coupling medium between the ultrasonic transducer and the object under inspection to be at a first predetermined temperature for which the attenuation of the ultrasonic energy in the coupling medium at the first predetermined temperature is reduced compared to the attenuation of the ultrasonic energy in the coupling medium at an ambient temperature. There is no suggestion in the cited references to operate at frequencies above 100MHz, and there is no teaching of how to cope with the problem of high attenuation that is associated with operating at

high frequencies.

In light of the foregoing amendments and explanations, applicant submits that all rejections of claims 1-37 have been overcome. Allowance of claims 1-37 is therefore respectfully requested at the Examiner's earliest convenience. Although additional arguments could be made for the patentability of each of the claims, such arguments are believed unnecessary in view of the above discussion. The undersigned wishes to make it clear that not making such arguments at this time should not be construed as a concession or admission to any statement in the Office Action.

Please contact the undersigned if you have any questions regarding this application.

Respectfully submitted,



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